**China's Investment in African Hydropower: How to Govern the Water-Energy-Nexus? Evidence from the Bui Dam in Ghana**

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**Introduction**

The hydropower boom across the global South to build up energy infrastructure has been enabled by a range of factors: technological progress that makes it easier to extract water from difficult terrain; new forms and origins of finance from emerging economies, in particular China, that have largely replaced public funding for hydropower from the global North; and a global climate change discourse that encourages investment into hydropower and incentivises it through a range of market mechanisms including the Kyoto Protocol's Clean Development Mechanism (CDM).[i]

The latter involves what Wanner (2015: 21) called the 'neoliberalising of nature' through the 'privatisation, marketisation and commodification of nature' which 'divert[s] attention from the social and political dimensions of sustainability and issues of social and international justice.' Green growth has been promoted by key UN agencies including UNDP and UNEP. UNEP argues that 'to be green, an economy must not only be efficient, but also fair. Fairness implies recognising global and country level equity dimensions, particularly in assuring a just transition to an economy that is low-carbon, resource efficient, and socially inclusive' (UNEP 2011: 24). Meanwhile, the World Social Forum has criticised the green economy agenda as the 'latest phase of capitalist expansion [that] seeks to exploit and profit by putting a price value on the essential life-giving capacities of nature' (cited in Middleton et al. 2015: 640).

Chinese infrastructure companies are investing in hydropower invited by host governments who have adopted the green energy terminology. The question is to what extent this investment is equitable and socially inclusive. As China is now Africa's most important partner in the construction of infrastructure, the extent to which Chinese firms adopt and implement environmental and social sustainability policies is important for the question of justice in Chinese investment projects, and research found that such policies – where they exist – are often formulated vaguely and implemented inconsistently (Hensengerth 2013; Cissé and Grimm 2015; Nordensvard et al. 2015; Hensengerth 2015a).

Nexus has become a popular concept in international development as it purports to address trade-offs between competing sectors drawing on the same resources (Bhaduri et al. 2014; Bhaduri et al. 2015). For hydropower, this primarily means the water-energy nexus, in other words the use of water for different uses, such as agriculture, energy and industry. In this trade-off, distributional issues between different sectors are addressed, but the impact on local communities is often neglected or treated as a side issue. A key question to answer is therefore who makes decisions for who in nexus both in general and in the specific case of hydropower, and how decisions can be made in an equitable manner so that communities affected by hydropower dams are involved in decision-making and benefit from the project.

This chapter deals with this governance question in the water-energy nexus by using an environmental justice perspective in order to focus on the impact of hydropower plants on local communities. The chapter draws particularly on David Schlosberg's seminal work on environmental justice and Carl Middleton's work on livelihoods and justice within the nexus (Schlosberg 2004; Middleton et al. 2015).

The chapter first sets out the problems of justice and governance in the water-energy nexus for hydropower development before addressing their transnational dimensions, which is produced by the involvement of transnationally operating corporations and financiers. The chapter then explores China's hydropower investment in Africa, followed by a brief description of Chinese engagement in Ghana's electricity sector. The chapter then explores the case of resettlement in the Bui dam project in detail.

Data comes from field work conducted during two weeks in July 2010 in Accra and at the dam site. All interviewees were assured anonymity given the political sensitivity of the issue. To ensure anonymity all interviews are coded, with the first letter indicating the place of interview and the sequence of numbers indicating the date. In Accra, interviews were held with the Bui Power Authority, the Energy Commission, the Water Resources Commission, the Environmental Protection Agency, the Ministry of Finance and Economic Planning, the Ministry of Energy, researchers, civil society organizations, and OECD donor agencies. At the dam site, interviews were held with community representatives in the Gyama temporary resettlement site and in villages still facing resettlement. At the time of interview Bui was still under construction and resettlement was ongoing. The 2010 material is therefore updated with literature that draws on field work conducted after this date, particularly after completion of the resettlement programme.

**Justice in the water-energy nexus**

The term nexus, which in international development practice has almost replaced the term Integrated Water Resources Management, denotes the interlinked nature between water use, food production, land use, and energy generation. In the literature it appears in different guises, including water-food-energy nexus, water-energy-climate change nexus and various other iterations of similar ideas (see for example Dale et al. 2015; Andrews-Speed et al. 2015; Biba 2016). In this chapter the focus will be on the links between water use and energy production and the impact this has on local communities and ecosystems. In this sense the chapter treats the water-energy nexus as a water-energy-environment nexus.

Nexus has often been used in quantifiable input-output terms considering factors such as water and land availability, crop yields, and distribution patterns (Bazilian et al. 2011; Smajgl et al. 2016; Leung Pah Hang et al. 2016). While some point primarily to a need for better coordination between different sectors (Rasul 2016), others have pointed to scalar a mismatch between the place of extraction and the location of beneficiaries (Gilron 2014). Biggs et al. (2015) argued that nexus frameworks have long lacked an explicit focus on livelihoods perspectives. In a similar vein, Middleton et al. (2015) and Allouche et al. (2014a) point to the need for considering environmental justice within the nexus and thus exploring nexus from a rights-based perspective by exploring the power and policy dynamics within nexus.

Key to this justice perspective is the impact of extractive water use by large hydropower plants on local communities. Large hydropower plants often transmit the energy extracted locally to urban residential and industrial centres. Magee has argued that the watershed is therefore an inadequate unit of analysis, coining the term 'powershed' to reflect firstly how local plants benefit often users far-away from the location of the hydropower plant, and secondly the role of – and power relationship between – hydropower companies, local politicians and national decision-makers (Magee 2006; McNally et al. 2009).

The consequence is that nexus not only describes sectoral competition between different water users and uses, but it also points to scalar trade-offs between local, national and global development goals (Hensengerth 2015b). As to the question of how to govern these trade-offs, Allouche et al. (2014b: 8) pointed out that the

> governance of these decisions, namely who takes decisions and for whom, is also important yet has been less rigorously discussed to date. Furthermore, given that food, water and energy sectors often exist in silos, integration may be challenging to put into practice. That water, land and energy have different governing regimes will make nexus governance even more difficult.

These conflicts, plus a focus on livelihoods perspectives, can be articulated through the concept of environmental justice. To do so, this chapter employs Schlosberg's (2004) conceptualization of environmental justice as incorporating the following three elements:

> equity in the distribution of environmental risk [and goods], recognition of the diversity of the participants and experiences in affected communities, and participation in the political processes which create and manage environmental policy (Schlosberg 2004: 517).

Building on the work of Iris Young and Nancy Fraser, Schlosberg points out that social justice needs to simultaneously address 'institutionalised exclusion, a social culture of misrecognition, and current distributional patterns' (p. 519).

In the context of the water-energy nexus, such a perspective enables a focus on local communities that are affected by development interventions. For justice to be realized, decision-makers need to address the effect development interventions have on communities. This is particularly true for communities who derive their livelihoods from local water sources that are earmarked for hydropower generation. This is especially important as new hydropower locations are often in remote and difficult to access locations and are mostly inhabited by rural communities who derive their livelihoods *inter alia* from subsistence agriculture, fishing or non-timber forest products – with some of the produce sold on local markets – but also indigenous communities with distinct cultural or religious traditions associated with rivers and forests as abode of protective deities and ancestral spirits.

**The transnational dimension of the water-energy nexus: China's investment in Africa's energy infrastructure and the role of hydropower**

Local socio-ecological systems can not only be affected by national development strategies, but also by global processes and are therefore influenced by events, actors and processes occurring at different scales (Young et al. 2006; Zurlini et al. 2006). Smitts and Middleton (2014: 564-565) pointed out that hydropower discourses are created by actors who come together in different arenas, and these configurations create specific power relations and decisions. They argue that these arenas can be simultaneously multi-scale and multi-place. Looking at the CDM mechanisms as an incentive structure for private investment into large hydropower stations, the authors list global (CDM Executive Board), national (Designated National Authorities, international and national consultants), and local (project developers, local authorities, affected people) arenas or scales (p. 565, Table 1).

Within the same scale, however, competing discourses and power configurations exist. This is particularly so for the local scale where Smitts and Middleton locate project developers and project-affected people. When looking at Chinese developers, we might also locate them at the international level to the extent

that they operate transnationally. This is important as dam funding has seen a marked shift. Since the emergence of the environmental sustainability discourse in the global North in the 1980s, public funding for large dams via donors grouped in the OECD's Development Assistance Committee has all but disappeared. This funding has been replaced by infrastructure companies and financiers from emerging economies, driven by strategic motives of profit and market access. Chinese companies have now emerged as global leaders in the hydropower industry, a phenomenon linked to processes of globalization as well as the emergence of new donors and investors as a new source of infrastructure finance and construction.

Looking at Chinese activities in Africa in the infrastructure and energy sectors, according to a report by South Africa's Standard Bank, cited in a 2012 OECD report, China funded about two-thirds of African infrastructure since 2007, surpassing the World Bank (Freemantle and Stevens 2010 cited in OECD 2012: 48). In the energy sector, Chinese involvement in a range of projects including 'hydropower dams, gas-fired power plants and biogas appliances in rural villages, and construction of transmission lines and distribution networks tends to diversify the power generation capacity mix and increase energy access in urban as well as rural areas' (International Energy Agency 2016: 10. See the map below for details on geographical distribution and types of Chinese energy projects).

**Map: Greenfield power projects contracted to Chinese companies, 2010-20**



In the hydropower field Chinese infrastructure companies and banks have emerged as leading builders and financiers of large hydropower dams, benefitting strongly from the reluctance of Northern donors to fund such dams (the World Bank has recently re-engaged in funding large dams, provoking a conflict with U.S. Congress who has instructed the U.S. government through the 2014 Consolidated Appropriations Act to deny funding of these projects: Bosshard 2014; U.S. House of Representatives 2014: Section 7060). The China Overseas Dams List by International Rivers (last updated in November 2014) lists at 60 large hydropower or multipurpose projects pursued by Chinese companies in Africa in various stages of decision-making – from very initial considerations to the project having been completed.

The following sections explore these issues with relevance to Ghana. First we will look at Ghana's electricity supply situation, followed by Chinese involvement in the Ghanaian electricity sector, before focussing on resettlement in the Bui hydroelectric project.

**Ghana's electricity supply situation and the role of China in expanding capacity**

Ghana traditionally relied on hydropower produced by the Akosombo dam, commissioned in 1965. In 1982, the Kpong dam was commissioned. In 2013, the Bui dam was commissioned with the aim to add substantial capacity to the grid and to diversify economic growth away from the Southern regions into the North. A fourth hydropower project, the Pwalugu Multipurpose dam on the White Volta River, is currently undergoing feasibility studies and an environmental and social impact assessment. In the late 1990s, oil became an important fuel with the first thermal plant coming online at Takoradi (330MW) in 1997 and a second plant at Takoradi in 2000 (the 220 MW Takoradi II plant). Since the late 2000s natural gas has increased in importance (see Figure 1 and International Energy Agency 2016: 35). At the end of December 2014, hydropower contributed 55.8 percent of total installed capacity – of this Akosombo constituted 36 percent, Kpong 14.1 percent, and Bui 5.7 percent – thermal power contributed 44.1 percent, and renewables in the form of solar 0.1 percent (Energy Commission of Ghana 2015: 5).

**Figure 1: Electricity Generation by Fuel in Ghana**


Direct link to source: http://www.iea.org/stats/WebGraphs/GHANA2.pdf (accessed 21 December 2016)

Odoom (2015) argued that China has become a key partner in Ghana's development due to its provision of infrastructure, particularly in the energy field including hydropower and gas plants. Chinese companies are active across a number of fuels, as well as in the distribution sector. In 2007, Shenzhen Energy and the China Development Fund created the Sunon Asogli Power Company for a gas-fired plant at Tema. In addition, Sinohydro is Engineering, Procurement and Construction (EPC) contractor for the China Development Bank-funded Western Corridor Gas Infrastructure Development Project. Phase I, commissioned in April 2015, connects the Jubilee oil fields via a gas processing plant at Atuabo to the plants at Takoradi. Phase II is to build an offshore jetty system to connect the Jubilee fields via ship to Tema (International Energy Agency 2016: 35).

Further, China Exim Bank provided China International Water and Electric Corporation with loans to participate in Ghana's rural electrification projects, particularly in the Upper West Electrification Project where the firm built power transmission lines to connect 468,000 households. In addition, Hunan Construction Engineering Group participated in the Northern Regional Electrification project. In April 2016, Ghana's 20MW solar PV plant came online, which was developed by a private Chinese company (International Energy Agency 2016: 36).

In the hydropower field, Sinohydro was EPC contractor for the Bui hydropower plant, and it is this project which will occupy the remainder of the chapter.

**China and the Bui dam**

The Bui dam forms a key part of Ghana's electricity supply strategy with the aim to diversify economic growth away from the South to the North. It is controversially located on the Black Volta River where it flooded a substantial part of Bui National Park. Bui was commissioned in December 2013. With an installed capacity of 400MW the dam produced 730 gigawatt hours in 2014 (Energy Commission of Ghana 2015). The output of the dam was meant to increase as the reservoir reaches full capacity (International Energy Agency 2016: 36).

The history of the planning of the Bui Dam dates back to 1925, when Albert Kitson discovered the Bui Gorge and found it suitable for a hydroelectric dam. However, although by 1978 plans for Bui had reached an advanced planning stage, the plans suffered from coups d'état, the relative cost of thermal power, and a lack of interest by companies to bid for tenders. In 2002, in a renewed attempt to build Bui but facing a lack of interest by companies to bid for a tender, President Kufuor decided to ask China and Russia for help. In 2005, the government announced that the Chinese government had expressed willingness to fund the dam, with financing from China Exim Bank and construction by Sinohydro. The government tasked UK-based Environmental Resources Management to conduct an Environmental and Social Impact Assessment (ESIA) and a Resettlement Planning Framework (RPF), which the firm submitted in 2007 (for a detailed history see Fink 2005: 69-72). In 2007 the Ghanaian parliament passed Act 740 establishing the Bui Power Authority as project owner with full responsibility for planning, executing and managing the Bui project (Zigah 2009: 25).

As EPC contractor Sinohydro was in charge only of dam construction, but resettlement fell into the responsibility of the BPA. Nevertheless, it was Chinese initiative that eventually led to the realization of Bui, which otherwise might have remained stuck in the planning phase (Kirchherr et al. 2016). The project is part of the Chinese government's Going Out strategy by which it lends political and financial support to Chinese companies wanting to expand their investment activities abroad. As seen above, Ghana is an increasingly important market for Chinese energy investment, and the Bui investment can be seen as a strategic decision to gain access to that market.

Bui is firmly embedded in a discourse of reliable energy supply for economic growth as well as green growth. This however neglects the human dimension of the investment and as a consequence the problem of social justice. By looking at the resettlement of Bui, it is this issue area to which we now turn.

**Resettlement and livelihoods in the Gyama resettlement community**

A total of seven villages plus the Bui National Park personnel living at Bui Camp had to be resettled. This was the responsibility of the Resettlement Office, established in the Bui Power Authority (BPA). Resettlement was divided into three phases: A, B and C. During Phase A, which began in May 2008, the four villages at the dam site were resettled: Brewohodi, Agbegikuro, Dam Site and Lucene were relocated to the Gyama Resettlement Community by June 2012, after first having been relocated to a temporary resettlement site. During Phase B, which started in June 2010, the inhabitants of villages in the inundation area were resettled: Bui Village, Bator-Akanyakrom and Dokokyina were relocated to Bui Resettlement Township by June 2011 between Bongase and the dam site. The BPA emphasized that this resettlement location was agreed with the resettlers. During Phase C, the personnel of the Game and Wildlife Division working at Bui National Park and living at Bui Camp was resettled (Bui Power Authority, no date_a; Bui Power Authority, no date_b). In total 219 households or 1216 people were resettled.

Recommendations for resettlement were spelled out in the Resettlement Planning Framework (RPF) submitted by UK-based consultancy Environmental Resources Management in January 2007 together with the Environmental and Social Impact Assessment. The RPF will form the basis of analysis to assess the extent to which the BPA adhered to resettlement guidelines regarding the implementation of recommendations for public participation and livelihood reconstruction.

*Legal basis*

The RPF uses World Bank guidelines and Ghanaian law to lay out requirements for resettlement. The World Bank Operational Policy on Involuntary Resettlement (O.P. 4.12 and its Annex A), the World Bank Involuntary Resettlement Sourcebook and Ghana's 1992 Constitution, 1986 Land Title Registration Act, 1962 State Lands Act, 1962 Administration of Lands Act, 1960 State Property and Contracts Act and 1965 Public Conveyancing Act.

A striking difference between Ghanaian and World Bank standards is that Ghanaian legislation does not require public participation in expropriation or the development of resettlement sites; however, Ghanaian regulations for Environmental and Social Impact Assessment (ESIA) require public consultations during which resettlement issues may be raised (Environmental Resources Management 2007: 67, 70). Minutes of local consultations held during the ESIA phase and lists of stakeholders included in the ESIA study are annexed to the RPF (Environmental Resources Management 2007: Annex E and F).

To reconcile these differences, the RPF recommended that '[p]ublic participation in the process of land acquisition and proposed resettlement must be promoted. Procedures or guidelines for such public consultation ought also to be clearly spelt out' (Environmental Resources Management 2007: 78).

For the development of resettlement areas, the RPF suggested that:

> New resettlement sites or host communities must be provided with basic infrastructure and public services to ensure that basic levels of amenities are accessible to the displaced persons and host communities. The provisions of the 1992 Constitution which requires that resettlement sites must be 'suitable' having due regard for their economic well-being and social and cultural values should be adhered to (Environmental Resources Management 2007: 79).

According to the World Bank Involuntary Resettlement Sourcebook, resettlement sites should be 'acceptable to the resettlers; have the capacity to support the incomes and living standards of the people to be resettled; provide for population growth; supply infrastructure and services better than, or at least similar to those available before resettlement; and be incorporated into the jurisdiction of local government agencies before completion of the resettlement programme' (Environmental Resources Management 2007: 101 and Box 10.1). In addition, according to Ghanaian and World Bank standards, resettlement villages must be equivalent to or better than the original settlements (Environmental Resources Management 2007: 101).

The RPF identifies three groups of affected persons eligible for compensation: Group 1 comprises households requiring resettlement, and these are entitled to full rehabilitation measures. Group 2 comprises households that lose land but do not need to be resettled; these will receive compensation for land (should they own it), crops, trees, grazing and forest products. Households that lose more than 20 per cent of their land will be captured by a Livelihood Enhancement Programme that is designed to produce livelihoods of at least the same level as before relocation. Group 3 comprises host communities; these will receive rehabilitation measures in relation to 'pressure on natural resources, public infrastructure, and social services.' In addition to all the above, households 'with limited resources' will receive additional help with relocation; households 'unable to restore or improve their livelihoods' after relocation will be classified as vulnerable and will receive special assistance (Environmental Resources Management 2007: 83-84, 90, Table 9.3).

Compensation is of four types: cash, in-kind ('land, houses, other structures, building materials, seedlings, agricultural inputs and financial credits for equipment'), assistance (such as a 'transition allowance, transportation and labour') and replacement ('of public services, infrastructure and productive assets such as fish ponds') (Environmental Resources Management 2007: 90, Table 9.2, 96).

In the following the focus is on the Gyama resettlement site, where the relocated villages fall into group 1, i.e. households requiring resettlement.

*Implementation*

Miine (2014: 75-77) and Obour et al. (2016: 293-294) report that access to health care, education and housing has overall improved for the resettled population. Furthermore Bui resettlement was a marked improvement when compared to the Akosombo dam resettlement (Obour et al. 2016). However, significant problems in livelihoods restoration remain.

To oversee and monitor resettlement the RPF suggested the creation of a Steering Committee composed of official representatives of the BPA, district officials, chiefs, the Land Valuation Board and NGOs. The Steering Committee would have cooperated with a Working Group made up of a Resettlement

Coordinator, village representatives, NGOs and technical personnel in charge of host site preparation (architects, agricultural experts, etc.). The Working Group would have been responsible for implementing resettlement, including pre-resettlement consultation and overseeing the process of relocation – which would have involved regular coordination with the construction contractor. After resettlement, the Working Group would have been responsible for implementing and monitoring rehabilitation measures and responding to grievances (Environmental Resources Management 2007: 122-133).

In addition, internal monitoring and evaluation would have been conducted as part of the daily resettlement process, and progress would have been measured against a set of indicators. External monitoring would have been carried out by an independent agency applying a set of indicators three to sixth months, eighteen months and again thirty-six months after resettlement. The results would have been reported to the Steering Committee and the Working Group (Environmental Resources Management 2007: 141-146).

These arrangements were entirely ignored, except that the BPA appointed a Resettlement Officer, who is in charge of resettlement coordination, and some consultation did take place, although the villagers' view were not always incorporated into the decision-making process (Miine 2014: 64-66, 72-74). Furthermore, not all relevant issues were discussed, in particular the selection of resettlement sites (Urban et al. 2015: 583). Similarly, Sutcliffe (2009: 2-3) reported that the recommendations in the RPF for addressing villagers' concerns about their livelihoods[ii] were not taken up during resettlement. In particular, villagers were not given a timeframe for resettlement or for compensation payments, and they were not informed of appropriate channels of communication 'to make their grievances known.' Authorities ignored the Consultation Objectives in the RPF.

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To ensure the reconstruction of livelihoods after relocation, the RPF advocates the implementation of a Livelihood Enhancement Programme. This Programme adopts a two-pronged approach: the targeting of vulnerable households and the enhancement of livelihoods in resettled communities in general. The focus is on the major livelihood activities of the villages: agriculture; fishing; trading; and grazing, hunting and collection of forest products.

Looking at the fishing section of the Programme and the fate of the fishing community of Agbegikuro whose members were resettled on dry land, it becomes clear that the Livelihood Enhancement Programme was not implemented. The recommendations comprise the allocation of equivalent fishing grounds, the development of fishing opportunities (the establishment of fishing associations, business planning, micro-credit support, as well as storage, transport and processing refrigeration facilities) and the development of alternative livelihoods (agriculture, small service enterprises and artisan workshops and training for other livelihoods to be identified and for which there is demand) (Environmental Resources Management 2007: 98). In addition, to compensate for lost fishing grounds, the RPF suggests providing a 'transportation allowance for fishing equipment (boats etc.)' and a 'transition allowance until fishing livelihood is restored' (Environmental Resources Management 2007: 94, Table 9.6).

Before resettlement, the community of Agebegikuro had expressed the wish to be resettled at the river where there would be no flood during the rainy season to allow them continue fishing. The BPA however ignored the request, arguing that the community 'lacked technical expertise to assess and assist site selection' (Miine 2014: 66). Indeed, while some communication had taken place between the BPA Resettlement Office and communities, community suggestions were not included in the decision-making process (Miine 2014: 64-66). Resettlement also affected cultural life: Agbegikuro used to celebrate a festival involving communal fishing, during which the catch was distributed within and outside of the

community. Given the lack of fishing opportunities after resettlement, the festival can no longer be celebrated (Obour 2016: 292). Community members also claimed that, when they were resettled, they did not receive any seeds (having to buy them at the market instead), tools or training in farming (Interviews J01072010-3 and J01072010-2).

The problems reach beyond former fishing communities. An overall decline in livelihoods has resulted from constraints on agricultural production owing to low soil quality, lack of fertilizer and lack of experience of resettled communities (some of which were trading and fishing communities); long distance to markets to sell agricultural produce; long distance to rivers for fishermen and disappearance of some fish species; and absence of off-farm income generation. This in turn has resulted in lack of adequate food supply with adverse impacts on health. To supplement income, resettlers have opened illegal mining sites in the forest reserve, which in turn leads to destruction of parts of the forest (Miine 2014: 75-77). At the same time, some farmers at Jama resettlement site reported that their crop yields have remained the same, having changed to planting more maize, squash and gourd instead of yam and cassava (Obour 2016: 292). This suggests that livelihoods in the resettled communities are highly uneven depending on a range of factors including, but not limited to, occupational groups, existing skills and skills support.

Resettlers were given three types of cash compensation: first, a one-off payment of GH¢100.00 per person regardless of age; second, a farm grant of GH¢50.00 per household to enable initial crop cultivation (two acres per household); and third, a monthly allowance for one year from May 2008 to April 2009 per household as temporary income support, based on calculations made by the Faculty of Human Settlement of Kwame Nkrumah University of Science and Technology in Kumasi . This monthly allowance was meant to assist farmers to travel back to their fields, 4.5km from their new settlement, to harvest their produce while simultaneously developing their new fields at Gyama Resettlement Township (Zigah 2009: 28-29). However, Otu-Tei (2009: 113) said that resettlers had to spend a larger portion of the monthly allowance on food than on travel, because they 'were unable to access their old farms.' Indeed, resettlers claimed that even though they had been told that they could return to harvest their mangoes, they were not in fact allowed to do so (Interview J01072010-2). The fishing community from Agbegikuro reported additionally that the financial support was insufficient (Obour et al. 2016: 293).

Otu-Tei (2009: 110-112) also argued that the Gyama resettlement occurred 'immediately after the main season for planting maize and yam, the main staple foods in the area, because the resettlement was determined by the pace of the dam construction,' even though the RPF had provided information on the growing seasons for all crops grown in the area. He therefore concluded that 'critical issues' in resettlement implementation, such as 'compensation, preparation of resettlement site, relocation, implementation of livelihood programs, and monitoring were ignored […]. Completion of the dam was prioritized at the expense of sustainably restoring or improving the living conditions of the affected people' (Otu-Tei 2009: 116).

Writing five years after Out-Tei, Miine echoes his assessment arguing that the BPA has focussed on physical relocation rather than economic and social development (Miine 2014: 75). As a consequence, the Gyama resettlement community has 'the growing feeling of … living in a foreign land (Miine 2014: 77).' Furthermore, the lack of institutionalized procedures and the regular interference of the Gyama chief from who the BPA acquired the land for the resettlers 'robs them of their freedom, causes social disarticulation, reduction in right to resources and powerlessness' (Miine 2014: 77).

**Discussion and conclusion**

While the Ghanaian government has added a new, possibly clean, energy facility to its energy generation mix and may claim to contribute its share to the global green energy agenda, local communities have suffered from an ill-executed resettlement programme. The project therefore exemplifies the scalar trade-offs occurring from a singular focus on energy generation to attain national development goals but a lack of engagement with water governance issues and attention to the effects on local communities.

The dam shows how local socio-ecological systems are affected by the globalization of the hydropower industry and also by emergence of China as a key source of finance and technical capacity in hydropower construction. Indeed, it was Chinese engagement that enabled eventual construction of the Bui Dam. Local communities therefore face a particularly difficult situation in which the interests of the national government, multinational corporations, and emerging economies are linked. This produces a situation in which communities do not only face their governments but also transnationally operating actors that are not accountable, meaning that there are no formal processes through which local communities could hold transnationally operating companies to account.

Furthermore, a robust environmental policy within Sinohydro and China Exim Bank could have improved the impact the dam has on local communities. After all, Exim Bank procedures at the time already required that the bank checks the quality of the environmental and social impact process during the dam planning process before approving the credit facility. Therefore, an improvement of environmental policies and credit approval procedures on the Chinese side should result in less harmful projects even in projects where Chinese actors are not involved in the resettlement process, as was the case for the Bui dam.

Regarding nexus governance the question of who makes decisions for who is in practice determined by the developmental strategies of governments. A focus on extractive water use for the building up of electricity capacity results in neglect of the concerns of local communities. Looking at Schlosberg's (2004) characteristics of environmental justice as incorporating equity, recognition and participation we can conclude that the Bui project meets none of these requirements fully. Environmental risks are entirely the problem of the resettled community, resulting for instance in lack of access to freshwater resources for fishing or lack of fertile land. Recognition of ethnic diversity is equally problematic, with the community no longer able to celebrate a traditional fishing festival, fishing communities being resettled on dry land without access to their traditional fishing grounds or lack of access to new fishing grounds to practice traditional economic activities. Moreover, there was a lack of government assistance for training in agricultural practices in order to reconstruct livelihoods. Participation in the decision-making process has also been lacking, with villagers' requests not having been taken on board by the BPA.

The consequence is deprivation in resettled communities or at least a difficult start into a new life. Also, some resettlers fare better than others, suggesting that pre-existing skills and knowledge such as in farming practices help some community members to start out easier in the new location than others. Government focus on building Bui for energy generation suggests a lack of equal emphasis on the difficult and costly task of livelihood reconstruction along the lines suggested by the Livelihood Enhancement Programme in the RPF.

In cooperation with Chinese financiers and infrastructure companies, and supported by matching interests between the Chinese government's Going Out strategy and the Ghanaian government's energy strategy, a transnational alliance has been formed with the BPA as project owner. This alliance has been created to the detriment of the interests of project-affected people who find it difficult to make their voices heard. This questions the notion of the social sustainability of large hydropower projects. While

they may help electrification (reservoir levels permitting), local populations do not derive substantial benefits but suffer disproportionately.

Considerations of environmental justice and scalar mismatches are therefore key to the effectiveness of the nexus concept. A scalar mismatch between water extraction and distribution of benefits is at the heart of the problem of large hydropower plants. This mismatch should be tackled by focussing on local livelihoods. It is only then that the idea of nexus can produce equal benefits for project-affected people and urban residents who are most likely to benefit from large hydropower projects. A focus on equity, recognition and participation must lead to a balance between local, national and global development goals to make hydropower dams truly sustainable.

**References**


Allouche, Jeremy, Carl Middleton and Dipak Gyawali (2014a) Interrogating the Power Linkages behind the Nexus,' Water Alternatives 8(1): 610-626.

Allouche, Jeremy, Carl Middleton and Dipak Gyawali (2014b) Nexus Nirvana or Nexus Nullity? A Dynamic Approach to Security and Sustainability in the Water-Energy-Food Nexus. STEPS Working Paper 63. Brighton: STEPS Centre.

Andrews-Speed, Philip, Raimund Bleischwitz, Tim Boersma, Corey Johnson, Geoffrey Kemp and Stacy D VanDeveer (2015) Want, Waste or War? The Global Resource Nexus and the Struggle for Land, Energy, Food, Water and Minerals. Abingdon: Routledge.

Bazilian, Morgan, Holger Rogner, Mark Howells, Sebastian Hermann, Douglas Arent, Dolf Gielen, Pasquale Steduto, Alexander Mueller, Paul Komor, Richard S. J. Tol and Kandeh K. Yumkella (2011) 'Considering the Energy, Water and Food Nexus: Towards an Integrated Modelling Approach,' Energy Policy 39(12): 7896-7906.

Bhaduri, Anik, Janos Bogardi, Jan Leentvaar and Sina Marx (eds.) (2014) The Global Water System in the Anthropocene: Challenges for Science and Governance. Berlin et al.: Springer.

Bhaduri, Anik, Claudia Ringler, Ines Dombrowski, Rabi Mohtar and Waltina Scheumann (2015) 'Sustainability in the Water-Energy-Food Nexus,' Water International 40(5-6): 723-732.

Biba, Sebastian (2016) 'The Goals and Reality of the Water-Food-Energy Security Nexus: The Case of China and Its Southern Neighbours,' Third World Quarterly 37(1): 51-70.

Biggs, Eloise M., Eleanor Bruce, Bryan Boruff, John M. A. Duncan, Julia Horsley, Natasha Pauli, Kellie Mcneill, Andreas Neef, Floris Van Ogtrop, Jayne Curnow, Billy Haworth, Stephanie Duce, Yukihiro Imanari (2015) 'Sustainable Development and the Water-Energy-Food Nexus: A Perspective on Livelihoods,' Environmental Science and Policy 54: 389-397.

Bosshard, Peter (2014) 'US Congress Takes Landmark Decision for Rivers and Rights,' International Rivers, 15 January 2014, https://www.internationalrivers.org/blogs/227/us-congress-takes-landmark-decision-for-rivers-and-rights (accessed 18 October 2016).

Bui Power Authority (no date_a) Bui Power Authority Resettlement Programme, http://www.buipower.com/node/13 (accessed 11 October 2016).

Bui Power Authority (no date_b) Resettlement Communities, http://www.buipower.com/node/14 (accessed 11 October 2016).

Cissé, Daouda and Sven Grimm (2015) 'Chinese Investments in Africa: Corporate Responsibility and Sustainability Norms,' International Journal of Business Governance and Ethics 10(3-4): 285-304.

Dale, Larry L., Nihan Karali, Dev Millstein, Mike Carnall, Sebastian Vicuña, Nicolas Borchers, Eduardo Bustos, Joe O'hagan, Joe, David Purkey, Charles Heaps, Jack Sieber, William D. Collins and Michael

D. Sohn (2015) 'An Integrated Assessment of Water-Energy and Climate Change in Sacramento, California: How Strong is the Nexus?,' Climatic Change 132(2): 223-235.

Energy Commission of Ghana (2015) National Energy Statistics, 2005-2014. Accra: Energy Commission of Ghana.

Environmental Resources Management (2007) Resettlement Planning Framework for the Bui Hydropower Project. Accra: Environmental Resources Management.

Fink, Michael (2005) Integrating the World Commission on Dams Recommendations in Large Dam Planning Processes: The Case of Bui, Ghana. Diploma thesis, Faculty of Spatial Planning, University of Dortmund.

Freemantle, Simon and Jeremy Stevens (2010) BRIC and Africa: New Partnerships Poised to Grow Africa's Commercial Infrastructure. No place: Standard Bank.

Gilron, Jack (2014) 'Water-Energy Nexus: Matching Sources and Uses,' Clean Technologies and Environmental Policy 16(8): 1471-1479.

Hensengerth, Oliver (2013) 'Chinese Hydropower Companies and Environmental Norms in Countries of the Global South: The Involvement of Sinohydro in Ghana's Bui Dam,' Environment, Development and Sustainability 15(2): 285-300.

Hensengerth, Oliver (2015a) 'Global Norms in Domestic Politics: Environmental Norm Contestation in Cambodia's Hydropower Sector,' The Pacific Review 28(4): 505-528.

Hensengerth, Oliver (2015b) 'Where Is the Power? Transnational Networks, Authority and the Dispute over the Xayaburi Dam on the Lower Mekong Mainstream,' Water International 40(5-6): 911-928.

International Energy Agency (2016) Boosting the Power Sector in Sub-Saharan Africa: China's Involvement. Paris: OECD/IEA.

Kirchherr, Julian, Tim Disselhoff and Katrina Charles (2016) 'Safeguards, Financing, and Employment in Chinese Infrastructure Projects in Africa: The Case of Ghana's Bui Dam,' Waterlines 35(1), http://www.developmentbookshelf.com/doi/abs/10.3362/1756-3488.2016.005 (accessed 11 October 2016).

Leung Pah Hang, Melissa Yuling, Elias Martinez-Hernandez, Matthew Leach and Aidong Yang (2016) 'Designing Integrated Local Production Systems: A Study on the Food-Energy-Water Nexus,' Journal of Cleaner Production 135: 1065-1084.

Magee, Darrin (2006) 'Powershed Politics: Yunnan Hydropower under Great Western Development,' China Quarterly 185: 23-41.

McNally, Amy, Darrin Magee and Aaron T. Wolf (2009) 'Hydropower and Sustainability: Resilience and Vulnerability in China's Powersheds,' Journal of Environmental Management 90(Suppl 3): S286-S293.

Middleton, Carl, Jeremy Allouche, Dipak Gyawali and Sarah Allen (2015) 'The Rise and Implications of the Water-Energy-Food Nexus in Southeast Asia through an Environmental Justice Lens,' Water Alternatives 8(1): 627-654.

Miine, Licarion K. (2014) Sustainability of Bui Resettlement Scheme in Ghana. MSc thesis submitted to the School of Graduate Studies, Kwame Nkrumah University of Science and Technology, Kumasi, http://ir.knust.edu.gh/bitstream/123456789/6918/1/LICARION%20MIINE.pdf (accessed 11 October 2016).

Nordensvard, Johan, Frauke Urban and Grace Mang (2015) 'Social Innovation and Chinese Overseas Hydropower Dams: The Nexus of National Social Policy and Corporate Social Responsibility,' Sustainable Development 23: 245-256.

Obour, Peter B., Kwadwo Owusu, Edmond A. Agyeman, Albert Ahenkan and Angel N. Madrid (2016) 'The Impacts of Dams on Local Livelihoods: A Study of the Bui Hydrolectric Project in Ghana,' International Journal of Water Resources Development 32(2): 286-300.

OECD (2012) Mapping Support for Africa's Infrastructure Investment. No place: OECD.

Odoom, Isaac (2015) 'Dam in, Cocoa out; Pipes in, Oil out: China's Engagement in Ghana's Energy Sector,' Journal of African and Asian Studies, published online before print, 26 October 2015, doi: 10.1177/0021909615599419.

Otu-Tei, Clement (2009) Social and Economic Impacts of Hydroelectric Power Dams: The Bui Dam, Ghana. MSc thesis submitted to the University of Central Washington, Ellensburg, Washington.

Rasul, Golam (2016) 'Managing the Food, Water, and Energy Nexus for Achieving the Sustainable Development Goals in South Asia,' Environmental Development 18: 14-25.

Schlosberg, David (2004) 'Reconceiving Environmental Justice: Global Movements and Political Theories,' Environmental Politics 13(3): 517-540.

Smajgl, Alex, John Ward, and Lucie Pluschke (2016) 'The Water-Food-Energy Nexus: Realising a New Paradigm,' Journal of Hydrology 533: 533-540.

Smits, Mattijs and Carl Middleton (2014) 'New Arenas of Engagement at the Water Governance-Climate Finance Nexus? An Analysis of the Boom and Bust of Hydropower CDM Projects in Vietnam,' Water Alternatives 7(3): 561-583.

Sutcliffe, Claire (2009) Interviews with People to be Affected by Bui Dam: A Field Report, https://www.internationalrivers.org/resources/field-report-interviews-with-bui-dam-affected-villagers-3956 (accessed 13 October 2016).

UNEP (2011) Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication. No place: UNEP.

Urban, Frauke, Johan Nordensvard, Giuseppina Siciliano and Bingqin Li (2015) 'Chinese Overseas Hydropower Dams and Social Sustainability: The Bui Dam in Ghana and the Kamchay Dam in Cambodia,' Asia and the Pacific Policy Studies 2(3): 573-589.

U.S. House of Representatives (2014) Consolidated Appropriations Act, http://docs.house.gov/billsthisweek/20140113/CPRT-113-HPRT-RU00-h3547-hamdt2samdt_xml.pdf (accessed 18 October 2016).

Wanner, Thomas (2015) 'The New "Passive Revolution" of the Green Economy and Growth Discourse Maintaining the "Sustainable Development" of Neoliberal Capitalism,' New Political Economy 20(1): 21-41.

Young, Oran R., Frans Berkhout, Gilberto C. Gallopin, Marco A. Janssen, Elinor Ostrom and Sander van der Leeuw (2006) 'The Globalization of Socio-ecological Systems: An Agenda for Scientific Research,' Global Environmental Change 16(3): 304-316.

Zurlini Giovanni, Kurt Riitters, Nicola Zaccarelli, Irene Petrosillo, K. Bruce Jones and Rossi L. (2006) 'Disturbance Patterns in a Socio-ecological System at Multiple Scales,' Ecological Complexity 3(2): 119-128.

Zigah, Sylvester (2009) 'Speech to Participants at the 1st Annual Meeting of Dam Affected Communities,' in: International Water Management Institute, Volta Basin Development Foundation and GTZ (ed.) Proceedings of the 1st annual meeting of dam affected communities. Akuse: International Water Management Institute, Volta Basin Development Foundation and GTZ, pp. 25-30.

[i] CDM was established under the Kyoto Protocol to enable low-carbon development in the global South by incentivising investment from developed countries into clean energy facilities.

ii For details on issues raised by stakeholders and how they are addressed in the RPF see Environmental Resources Management (2007: 115-116, Table 13.1).